



Request to Release CEV Orion TSP images acquired at AEDC Tunnel 9

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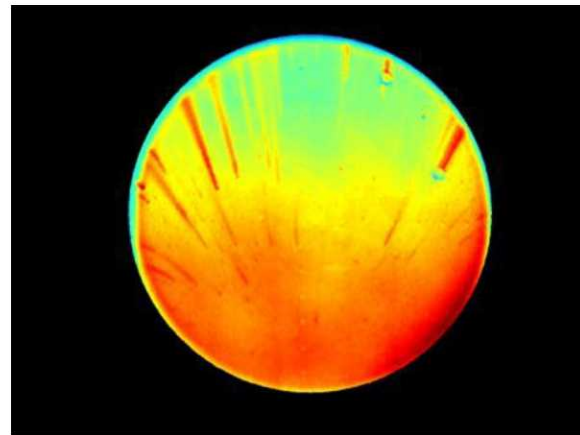
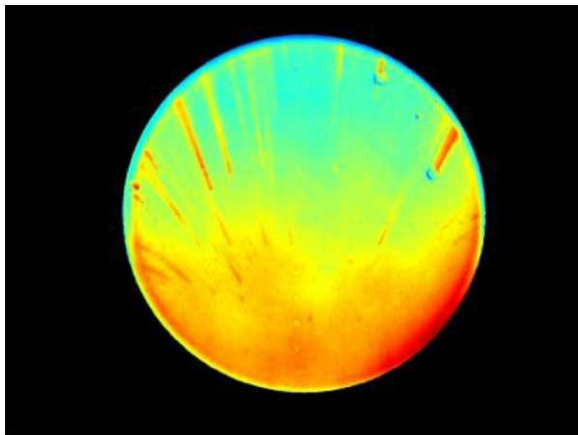
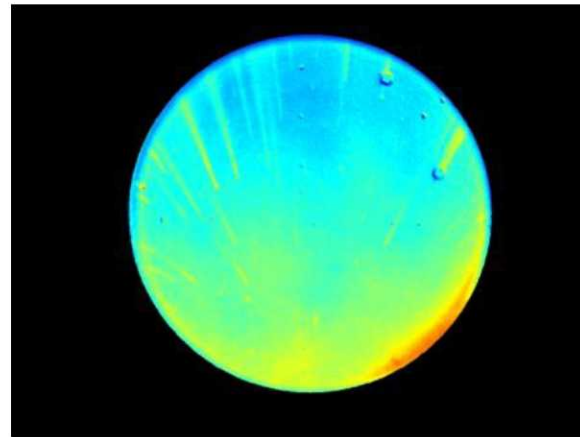
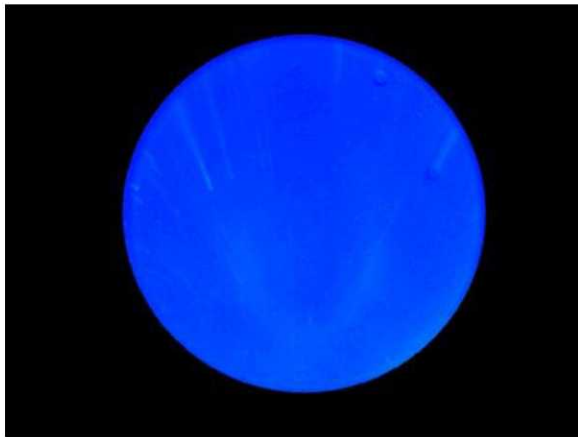
DSN 290-6430

**Air Force Materiel Command
Arnold Engineering Development Center
Arnold Air Force Base, TN 37389**

Description of Data

- Data consists of images of the CEV heat shield acquired using the temperature sensitive paint system during the FY06 CEV test at Tunnel 9
 - The colored images are of temperature, NOT heat-transfer rate or Stanton number
 - The color scale relating the color on the image to absolute temperature will NOT be released
- Sample images are given on the next page. There are a total of about 2000 images from various runs that will be put together to form movies. The images are all very similar to those on the following page.
 - The movie will be used as part of a Public Affairs video about AEDC and will be shown at conferences, to potential customer and visitors of AEDC; foreign nationals will see the video.

Sample Images



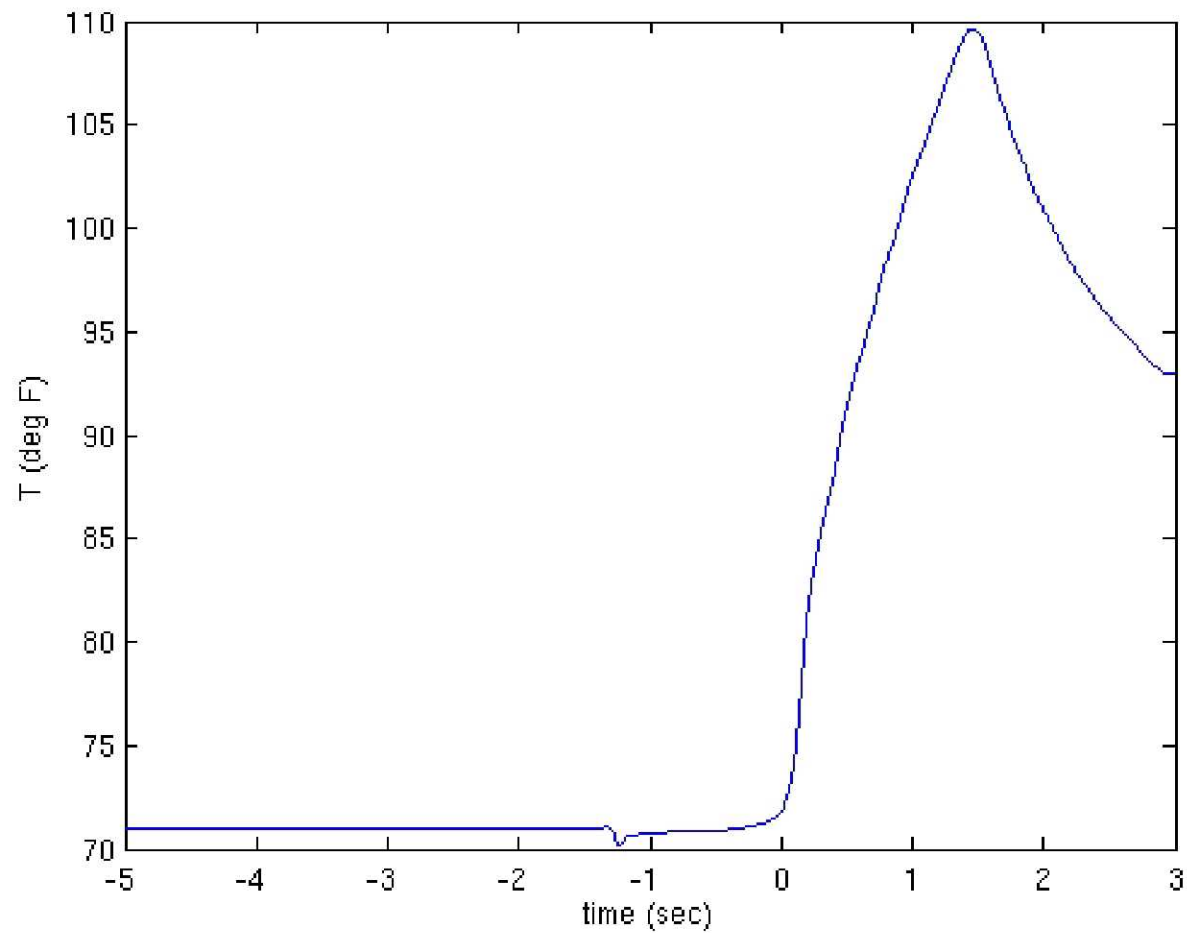
Approved for public release;
distribution is unlimited.

- Coaxial thermocouple surface temperature data versus time of a gage under the paint
- Computed heat flux derived from the coaxial thermocouple data versus time for an unpainted run, same test conditions, i.e. same Stanton Number
- Intensity from the temperature sensitive paint at the spot over the gage
- Additional information:
 - Thickness, radius of curvature, shape of model wall (spherical) at the data location
 - Density, specific heat, and thermal conductivity of the metal wall
 - Thickness of the paint layer
- The smooth-wall heat flux data, presented in Stanton number, can be found publically released in the AIAA paper:
 - “Aeroheating Testing and Predictions for Project Orion CEV at Turbulent Conditions,” Hollis, B. R., et. al, AIAA 2009-1226, 46th AIAA Aerospace Sciences Meeting and Exhibit, 7-10 January 2008, Reno, NV

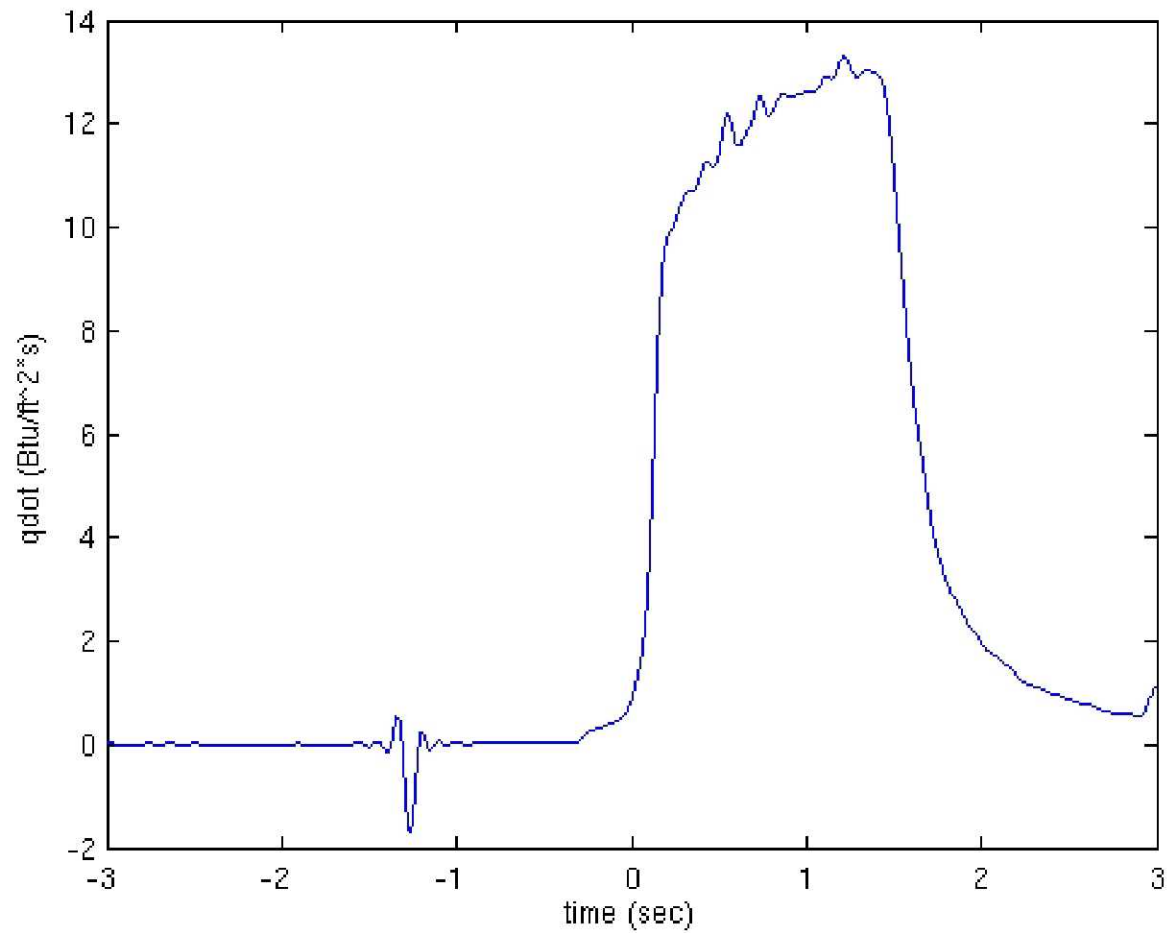
DATA

- Steel properties for the wind tunnel model
 - $\rho = .284$; % lbm/in³
 - $K = (1E-7)*T + .0002$; % Btu/in*s°F
 - $C_p = (-6E-11)*T^3 + (1E-7)*T^2 - (1E-6)*T + 0.1063$; % BTU/lbm°F
- Wall thickness of the wind tunnel model, 0.375-in. (gage T33)
- Model wall is *spherical*, radius = 8.4-in.
- Initial Temp at start of run (isothermal model) can be found in the thermocouple data. This file includes wind-on and wind-off data.
- Thickness of the TSP layer, 0.0021-in.
- In the following slides, plots of the tabulated data are shown

Thermocouple T history under the paint layer at the location where the I/Iref is provided



Note that \dot{q} is from an unpainted run with the same flow conditions as the TSP run



Surface I/I_{ref} history over the thermocouple

